

ARIZONA DEPARTMENT OF TRANSPORTATION

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AN ANALYSIS OF THE EFFECTIVENESS OF WRITTEN DRIVER LICENSE EXAMINATIONS IN EVALUATING APPLICANT DRIVING ABILITIES

Arizona Driver Licensing for the Nineties Task II

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**AN ANALYSIS OF THE EFFECTIVENESS OF WRITTEN DRIVER LICENSE
EXAMINATIONS IN EVALUATING APPLICANT DRIVING ABILITIES**

**Report of Task 2
ARIZONA DRIVER LICENSING FOR THE NINETIES**

**submitted by
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16. ABSTRACT A driver licensing system for Arizona in the nineties and beyond has been designed through a comprehensive analysis of the state-of-the-art for driver licensing. The prominent features of the designed licensing system are listed below: 1) Develop a classified driver's license. 2) Provide for provisional licensing. 3) Ensure testing for license renewal. 4) Improve and expand manuals and tests consistent with a classified system. 5) Provide oral testing using flashcards and audio cassettes where necessary. 6) Administer road tests to applicants for truck and bus and tractor-trailer licenses. 7) Maintain the current motorcycle skill testing procedure.			
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TASK 2 - ARIZONA DRIVER LICENSING FOR THE NINETIES

This report describes the activities undertaken in, and the results obtained from Task 2, "Arizona Driver Licensing for the Nineties", of a study entitled "An Analysis of the Effectiveness of Written Driver License Examinations in Evaluating Applicant Driving Abilities," Research Project No. HPR-PL-1(25) Item 225.

OBJECTIVES OF THE STUDY

The overall goal of the effort described is to recommend actions that can be taken by the Arizona Department of Transportation to improve the effectiveness of the Arizona written driver license examination as a means of assuring the qualifications of Arizona drivers. In achieving this overall goal, the following objectives must be fulfilled:

1. To analyze the Arizona Driver License Examination to identify needs for improvement--Once the state-of-the-art has been surveyed, the results need to be compared with the present state of the Arizona driver license knowledge examination, and the system of which it is a part. Discrepancies between the two will identify areas in which improvement can be sought.
2. To assess the state-of-the-art in driver license knowledge examination--The first objective will be to undertake a broad survey of driver license knowledge examination technology in order to identify what the state-of-the-art has to offer.
3. To define a set of goals and objectives for the Arizona Department of Transportation--From the needed improvements identified in fulfilling the second objective, those that are appropriate for the Arizona DOT must be identified. These needed improvements must then be fashioned into a set of attainable goals.
4. To identify a plan of action to enable the Arizona DOT to fulfill goals--A step-by-step plan of action needs to be formulated to enable the Arizona DOT to undertake the activities and to procure the goods and services needed to fulfill goals.

BACKGROUND

A little over a decade ago, Nuckols (1972) found the content of state driver license manuals and tests to be woefully deficient with respect to the needs of safe motor vehicle operation. Since that time, enormous strides have been made in improving the quality of driver license manuals and tests.

Factors Leading to Improvement

Among the factors responsible for this improvement are:

- o Federal driver licensing standards and the release of 402 funds to support innovative developments, including manuals, written tests, test equipment, etc.
- o Increased professionalism within driver licensing agencies leading to development of greater levels of experience and skill in development and use of driver testing methods.
- o Development of driver licensing guides, model tests, and other useful products by federal agencies and national private sector organizations.
- o Better communication among states and state agencies, leading to the sharing of information and products.
- o Research into driver information needs and effective means of fulfilling them.
- o Participation by the private sector in dissemination of information and marketing of products.

Study Needs

What was needed to bring the benefit of improvements in the state of the driver licensing art to Arizona was a study that surveys the state of the art and the State of Arizona, compares the two, and recommends improvements along with a plan for achieving them. In order to be of benefit to the Arizona DOT, the proposed study had to:

- o Carry out a survey of the driver licensing state-of-the-art that is as comprehensive, thorough, and up-to-date.
- o Objectively identify the advantages and disadvantages, benefits and liabilities, successes and failures of driver licensing examination innovations.
- o Make a thorough analysis of the Arizona licensing operation, its needs, and the constraints under which it operates.
- o Identify, for any contemplated improvement, the specific changes that need to be made, the obstacles to be overcome, the steps that must be taken to overcome them, the cost of instituting the change, the potential benefits to be realized, and the means of assessing those benefits.

Prior to the conduct of a survey and preparation of recommendations for overall improvements in driver licensing, the study was to carry out an analysis of the current Arizona Driver License Manual and Test and recommend specific revisions that would bring those particular items up to date.

THE ROLE OF LICENSE TESTS

People generally view the role of license tests as helping to prevent accidents and make the roads safer. However, their view of the way tests do this differs depending upon the model of the licensing process that they are assuming. The two most commonly assumed models may be termed the "quality assurance" model and the "selection" model.

Quality Assurance Model

According to the American Association of Motor Vehicle Administrators (AAMVA, 1967), the purpose of a license test is "to assure the applicant's ability to drive safely." This implies that the purpose of the test is not one of selection, but one of quality assurance.

Probably the most familiar application of a quality assurance model is the process by which products are inspected as they come off the production line. The function of inspection is not to see which products get "selected" and shipped to market. Unless almost all of them do, the company would quickly go out of business. The primary purpose of the inspection process is to assure the quality of the product by causing the people who produce it to achieve prescribed quality standards. Most of what the inspection process accomplishes is realized before the product ever reaches the inspector.

The same model applies directly to license testing. Drivers recognize they are going to have to exhibit certain abilities in order to pass the test. Accordingly, they practice until those abilities are attained. It is the activities that go on before the applicant ever reaches the licensing station that determine how well drivers perform. Like an inspection, most of what it accomplishes occurs before it is given.

There are other aspects of a quality assurance program that make it the appropriate model for licensing testing.

- o The success of a quality assurance program requires that testing be accompanied by materials that help in attaining quality standards. Almost all States provide manuals describing the laws and practices that make up safe driving. Similar manuals are needed for truck driving, although only seven States currently provide them.
- o Where the quality assurance process cannot assess all aspects of quality, it is important that those whose quality is being assured not know what will be assessed and what will not be. Otherwise, they will focus their attention upon the former to the sacrifice of the latter.

Selection Model

The selection model assumes that the selected people stay selected and the rejected people stay rejected. Such a model would be appropriate to tests administered to applicants for a driver position with a public carrier

of cargo or passengers, or in a company that operates its own fleet of heavy vehicles. Those who are selected get to operate the company's vehicles while those who are rejected go to work for someone else. If the test employed has validity in predicting accidents, use of the test should improve the company's accident records by employing safe instead of unsafe drivers. This will be true even if the predictive validity was not from the test, but from the correlation of test results with some other accident-correlated factors such as socioeconomic status, educational level, or marital status.

A test that was able to predict accident experience would not be very useful to a company that selected drivers no matter how they scored on the test. Yet, that is precisely what happens in a license test. Dreyer (1976) found that over 95% of people applying for a California driver's license in his study ultimately got one. If one assumes that some portion of the remaining 5% succeeded in getting a license in another State, then practically no one was screened out by the license test.

Summary

The assurance model is an appropriate one for designing a licensing system for Arizona. The purpose of testing Arizona drivers is to assure that only those who are capable of driving Arizona highways safely are legally permitted to do so. The licensing system seeks to achieve this, not by permitting only the best drivers to have licenses, but providing the means by which those who wish to drive can become qualified to do so. To be sure, there will be some small fraction of the population who simply do not have the physical or mental equipment to drive safely. However, this is an extremely small fraction--less than 1%--and certainly not the primary target of licensing activities. This report will attempt to describe means by which the MVD can seek to improve the safety of motor vehicle operation in Arizona through better qualified drivers.

A selection model tends to orient a test toward the inclusion of anything that is predictive of criterion performance. As noted earlier, there are a number of driver characteristics that are related to accidents, including age, prior driving record, marital status, educational level, and measures of socioeconomic status. The danger of application of this approach to licensing is that it can include many characteristics that do not play a causative role in accidents and violations. (For example, marital status is not a cause since divorced drivers don't experience immediate improvement upon remarriage.)

The issue of causation has not generally been of concern in job selection. The personnel manager of a trucking company can select any characteristic having predictive validity, including marital status. However, society has not generally been willing to allow the license to drive to be withheld on the basis of any factor that is not itself a cause. Because of the importance of mobility to economic survival and general well-being, only those factors that play a causative role, such as visual acuity and ability to handle the vehicle, are sanctioned. Of the factors just mentioned, only age serves as a basis for licensing, and that is only to the extent of ruling out the very young.

EFFECTIVENESS OF LICENSE TESTS

A good deal of empirical and theoretical research has gone into the evaluation of license tests. The results of this research have varied, depending largely upon the type of study employed.

Correlational Studies

In employing the selection model, several research studies have attempted to assess the validity of license tests by correlating scores with subsequent accident and violation records. Campbell (1958), McRae (1969), and Harrington (1973) all found significant but very small relationships. Kaestner (1964), as well as Waller and Goo (1968), found both positive and negative relationships depending upon the age and sex of applicants. Finally, Wallace and Crancer (1969), Freeburg and Creech (1972), Dreyer (1976), Conley and Smiley (1976), and Jonah and Dawson (1979) found a total lack of relationship. The results of these studies have generally led to the conclusion that license tests lack sufficient predictive validity to be used as a screening device in determining who gets to drive and who doesn't (Atkins, 1984). Predictive validity is used as a screening device in determining who gets to drive and who doesn't (Atkins, 1984). They support the statement voiced earlier by Uhlener and Drucker (1964) who pointed out that, if license tests were used to screen out drivers, it would end up barring from the road as many good drivers as it did bad drivers.

There are a number of reasons to question the use of predictive validity in evaluating the effectiveness of license tests.

Effect of Outside Factors--Several factors known to correlate both with test scores and accidents/violations could obscure the relationship between the two. Chief among these are age, sex, and educational level. Young males, for example, generally score high on any tests of manipulative skills while having poor accident and violation records. This relationship could counter any relationship resulting from direct causative effects upon accidents of variables measured by the test. Some studies have attempted to control for the effects of these variables statistically. However, such control can be exercised only over those outside variables whose relationship with test scores and accidents has been measured.

Change in Performance--In many of the studies cited, accidents were predicted on the basis of initial test scores. However, since the studies dealt with licensed drivers, applicants who failed must have studied and practiced until they were able to pass. How could one expect any correlation between scores and accidents/violations if the scores later changed?

Lack of Variance--A function of a licensing test is to cause applicants to attain the proficiency needed to perform safely. If the test is effective in this regard, applicants will achieve high levels of proficiency before the test is administered and pass. result is to reduce variance in test scores which, in turn,

reduces covariance between test scores and accident measures. In this regard, the more successful a test is, the more homogeneous would be the performance of applicants and the lower would be the correlation of the test with accidents.

Experimental Studies

The problems just described can be overcome if a license test is viewed as a measure of assuring quality (a "treatment") to be evaluated experimentally rather than a predictor to be evaluated correlationally. In an experimental evaluation:

- o The effect of all outside factors, including those that are unidentified, can be controlled through randomization.
- o Changes in score during the licensing process is not a problem since the scores don't figure in the evaluation.
- o For the same reason, lack of variance in the licensing scores is not a problem.

Only recently have efforts been made to evaluate license tests through random experiments. McKnight and Green (1976) evaluated written tests and accompanying manuals designed for teenage novice drivers, adult renewals, and renewals over age 55 in the State of Virginia. The first two showed significant accident reductions when compared with existing tests and manuals.

The California Department of Motor Vehicles evaluated the effect of improved motorcycle licensing tests consisting of a knowledge test and skill measure (Ford and Anderson, 1978). Those administered the improved test had fewer accidents than those administered the regular motorcycle license test. Even greater accident reduction was achieved by giving a three-hour skill test to those failing the skill component of the testing program.

Summary

Evidence indicates that, while license tests have little validity in predicting who will and will not be safe drivers, they are capable of working an improvement in safety of operation by drivers. Tests provide a means of inducing drivers to acquire the skills and knowledges to operate safely. While this has never been specifically assessed in the State of Arizona, there is no reason why the results obtained elsewhere would not generalize here. As will be noted later, tests must be accompanied by means through which drivers can acquire the necessary skills and knowledges. Resources necessary to provide this are available in Arizona.

STUDY APPROACH

NPSRI proposed a 3-phase approach to improving the effectiveness of the driver license examination as a means of assuring that Arizona drivers are qualified to operate motor vehicles safely.

Task 1 - Recommend Revisions of Test and Manual--involved the simultaneous survey of the state of the art in licensing and analysis of the current Arizona Driver License Manual and Examination. Information from these two sources was applied to recommendations for improvements that need to be made to the License Manual and Examination.

Task 2 - Arizona Driver Licensing for the Nineties--involved design of a driver license examination system based upon an analysis of the state of the licensing art.

Task 3 - Plan License Examination Program Implementation--will describe a series of steps by which the MVD can bring into being the system designed in Task 2.

Task 1 "Recommended Revisions of Test and Manual" was completed with submission of a report on March 15, 1985. This report provided the following:

1. Recommendations for changes in the Arizona Driver Manual considered desirable to improve its ability to communicate information needed by drivers to operate vehicles safely in the in the state of Arizona.
2. A revised manual incorporating changes identified in (1) above.
3. A description of activities undertaken to evaluate items making up the current written examination for Arizona drivers and the results of the evaluation.
4. Thirty-four test items designed to assess acquisition of information added to the manual through the revision process.
5. A truck operator manual and written test for use at such time as the state of Arizona revises its licensing system to require a separate license for truck and bus operators.
6. Reproducible copy of the revised Motorcycle Operator Manual and Motorcycle Written Test, developed by National Public Services Research Institute and distributed through the Motorcycle Safety Foundation.

CONTENTS OF REPORT

This report describes the driver licensing system capable of being implemented within the next five years in order to improve the safety of motor vehicle operation on the Arizona streets and highways throughout the

nineties and beyond. The recommended licensing system is based upon a survey of the driver licensing state of the art and its synthesis into a licensing system. The design of the system is intended to fulfill the study objectives (2) and (3) as enumerated on page 1 of this report.

The design of licensing system was based upon (1) the project staff's extensive experience in development and evaluation of licensing programs, and (2) an exhaustive survey of the driver licensing literature with specific references provided in the body of the report.

The discussion of an Arizona licensing system for the nineties will be organized as follows:

Structure--The kinds of licenses to be issued, and the relationships among them.

Qualifications--The mental and physical qualifications appropriate to each type of license.

Testing--The testing procedures that are most appropriate to assessment of qualifications.

STRUCTURE

The license structure recommended for Arizona is one that is generally called a "classified" licensing system. A classified license system is one which classifies drivers into different categories for licensing purposes. The categories are typically based upon the type of vehicle to be operated. However, some licensing structures also categorize drivers on the basis of conditions underwhich vehicles may be lawfully operated. For purposes of this discussion, both will be considered aspects of a classified license structure.

Arizona has a very limited classified licensing system. It consists of the following three categories:

Driver's License--A license to operate any motor vehicle except those for which a Chauffeurs License or Motorcycle Operators License is required.

Chauffeur's License--A license to operate a vehicle for hire or for purposes of employment.

Motorcycle License--A license to operate a motorcycle or motor driven cycle.

This section of the report will discuss classified license systems in reference to Arizona's needs and will offer some specific recommendations for an Arizona classified license system.

BACKGROUND

Before discussing the purpose of classified licensing for the state of Arizona, it is worth taking a moment to look at how license classification systems are structured.

Purpose of Classified Licensing

Legislatures enact classified licenses for different reasons. However, the major avowed purpose for having a classified license system is that different catagories of vehicle operation require different abilities, the possession of which drivers should be required to demonstrate before being allowed to operate on the public highways. Requiring different licenses for different catagories of vehicles provides a means by which the MVD's can require a demonstration of ability.

Basis of Classification

There are almost as many classified licensing systems as there are states. However, the structure of most systems are based upon the following three dimensions:

- o Level of Ability
- o Level of Responsibility
- o Type of Ability

Level of Ability

A common and logical basis for license classification is the level of ability required to operate a vehicle. The level of ability is generally thought to be closely related to the size of the vehicle being operated. The longer, wider, heavier the vehicle, the harder it is to maneuver within the fixed limits imposed by the highway traffic environment. Certainly, it is harder to keep within the confines of a ten foot travel lane when driving a tractor trailer that is eight and a half feet in width and sixty feet long than it is when driving an automobile that is only six feet wide and twelve feet long.

As of 1984, some thirty states classified licenses on the basis of vehicle size (FHWA 1984). Size has been reckoned in terms of gross vehicle weight, number of axels and articulation. Some use only one of these factors, while others use combinations.

Level of Responsibility

Arizona, like many other states, requires a special license to operate vehicles as a part of one's employment, or as it is more commonly known, "For Hire." The vehicles involved--taxis, buses, and trucks--are no more difficult to operate when being driven for hire than when being used for one's own transportation. However, transporting someone else's goods or person involves a higher level of responsibility.

As a reflection of the added responsibility, most states require operators of vehicles for hire to have a special "Chauffeur's" license. Many states require applicants for Chauffeur's License to be somewhat older and/or have somewhat more driving experience than applicants for regular drivers license. In some states, the visual standards for a Chauffer's License are more stringent than those for a regular license. '

Type of Ability

Some license classifications are based upon the fact that the type of driving ability involved is different, in operating various types of vehicles: it doesn't require more ability just different one. Operation of a motorcycle is a good example; the abilities needed for operating it are unique to that vehicle. School buses are another example. They are no harder to drive than any other bus. Picking up, transporting, and discharging children, however, involves a number of unique abilities.

Methods of Classification

States do not issue separate licenses for every category of vehicle for which separate licensing is required. There are three basic methods of classifying drivers for different types of vehicles:

- o License Class
- o License Endorsement
- o Conditional License

License Classes

In a system of license "classes" vehicles are placed in a hierarchy such that a license to operate one vehicle in the hierarchy also includes a license to operate all vehicles that are lower in the hierarchy.

The most common hierarchical classification, used by approximately half the states, involves three classes, corresponding to three vehicle size groups (1) tractor-trailer, (2) straight trucks and buses, (3) cars, van, small panel trucks. A driver holding the first class of license, can drive vehicles in all three classes; those in the second class can drive all vehicles except tractor-trailers; drivers in the third class can drive only vehicles in that class. The use of classes is based on the assumption that drivers who have demonstrated the ability to operate vehicles in the highest class, can also operate vehicles in lower classes and should not have to obtain separate licenses.

The difficulty with license classes rises with vehicles that don't fall in the hierarchy, such as motorcycles or school buses. Separate classes become necessary for each combination, e.g. one class for drivers licensed to operate motorcycles and not cars, another for motorcycles and cars, and yet another for motorcycles and trucks. The classification system then becomes very complicated. The use of license classes is most practical where categories can be ordered with a hierarchy on the basis of some factor such as size.

Endorsements

An endorsement system is extremely simple in that each vehicle a driver is allowed to drive is identified by a separate endorsement. A driver allowed to operate a tractor trailer, straight truck or bus, and automobile would carry three endorsements, one for each vehicle, rather than a single class of license. It isn't necessary that drivers demonstrate their ability to operate every type of vehicle for which they are seeking an endorsement. A driver who demonstrates his ability to drive a tractor trailer can automatically be given endorsements for smaller vehicles.

An endorsement system becomes more practical than license classes where there is not an underlying dimension (such as vehicle size) to form the basis of a hierarchy.

Conditional Licenses

Where license classes and endorsements specify the type of vehicle that drivers may operate, certain licenses specify the conditions under which operation may legally occur.¹ The conditions include the presence of a licensed adult, hours of travel, or travel area. Conditional licenses are issued for most of the vehicles covered by license classes and endorsements.

Recommended Classified License Categories

The Classified License System recommended for Arizona would consist of classes, endorsements and restrictions as follows:

License Classes:

1. Tractor-trailer
2. Trucks and Buses
3. Operator

License Endorsements:

- M. Motorcycle
- S. School bus
- E. Emergency vehicle
- C. Chauffeur

Conditional Licenses:

- L. Learner
- P. Provisional

The remainder of this section on classified licensing will discuss in depth each of the recommended categories of license class, endorsement, and restriction.

¹ Conditional licenses are not to be confused with the imposition of conditions on other licenses for reasons of medical condition, physical disability, or poor driving record.

LICENSE CLASS

The proposed classification system would distinguish three classes of license: tractor-trailer, trucks and buses, operators.

The use of three classes would allow drivers who have demonstrated the ability to operate a particular class of vehicle to be licensed for all other vehicles that they be considered qualified to operate without burdening themselves or the MVD with separate licensing action for each vehicle. Thus, a driver who is licensed to operate a tractor-trailer does not need to be separately licensed to operate a truck, bus, or automobile.

Trucks and Buses

While the recommended classified licensing system distinguishes between straight trucks (and buses) on the one hand and tractor-trailers on the other, we'll first discuss and justify the separate licensing for the entire truck and bus category before addressing the need for any distinctions within the category.

Accident Involvement of Trucks and Buses

Neither trucks nor buses appear to be overinvolved in accidents generally. According to figures furnished by the National Safety Council (NSC, 1983), trucks were involved in about 18.7% of crashes while constituting 21.1% of vehicle registrations. Combination trucks were somewhat more involved, being responsible for 3.6% of accidents and only 0.9% of registrations. Similarly, commercial buses were involved in .5% of accidents and .1% of registrations.

It is in the more serious accidents that trucks and buses seem to be a greater threat. Because of their heavier weight, any accident in which they are involved is likely to be more serious than would be an accident involving passenger cars. During 1982, trucks were involved in 24.6% of fatal accidents, compared with their 21.1% of total vehicle registrations. Combination vehicles were involved in 9.1% of fatal accidents in comparison with their .9% of registrations. Commercial buses, on the other hand, were involved in only .5% of fatal accidents--the same level of involvement as in non-fatal accidents.

It is difficult to determine to what extent the overinvolvement of trucks and buses in serious accidents is due to hazards inherent in the vehicles themselves--their size--and to what extent it is due to the number of vehicle miles that they travel. Trucks and buses compile far greater mileage on the average than do automobiles. Probably the most accurate compilation of heavy vehicle accidents relative to mileage is that prepared by the American Automobile Association (AAA 1983). Using fatality data from the Fatal Accident Reporting System and mileage from the Federal Highway Administration, AAA found combination trucks to be involved in 5.23 fatal accidents per 100 million vehicle miles traveled (V.M.T.). In contrast, passenger cars were involved in only 2.47 fatalities per 100 million V.M.T. Data on buses and single unit trucks are not available.

Vehicle Miles Traveled is not the only variable other than size to influence the relative accident involvement of trucks and buses. Other variables include the following:

Roadway--Heavy vehicles tend to compile their mileage on different roadways than do cars. For example, intercity trucks and buses tend to make greater use of interstate highways than do cars.

Time of Day--Trucks and buses are more likely to operate throughout the night and are, therefore, on the road during those times when serious accidents are most likely to occur.

Weather--In an effort to maintain schedules, commercial drivers are more likely to brave the elements and, therefore, encounter more hazardous driving conditions, than do car drivers.

Speed--Since an inordinate amount of truck and bus operation takes place on high speed highways, their accidents are likely to occur at higher speeds. The speed factor, along with the size of the vehicle, contributes to the relatively high severity of truck and bus accidents.

It is difficult to believe that these factors could account for more than a two-fold difference in fatal accidents between automobiles and combination trucks. The size of the vehicles--their length and weight--certainly account for much of the difference.

Need for Separate Licensing of Truck and Bus Operators

While the high severity of accidents involving trucks and buses has focused attention upon the operation of these vehicles, it does not by itself justify a separate license. It is the accident involvement, coupled with the special requirements that are imposed upon truck and bus operation, that justifies the need for a separate license. Special requirements arise with respect to each of the three variables upon which classified licensing systems are based: level of ability, type of ability, and responsibility.

Level of Ability--That increased vehicle length demands increased operating ability has been more or less assumed by the general public. As mentioned earlier, this is the primary basis for treating trucks and buses in separate license classes. Direct evidence of the relationship was found by McKnight, Kelsey, and Edwards (1984), who observed that scores on an offstreet skill test were inversely correlated with the vehicle length. The actual correlations were .54 for straight trucks and buses and .31 for articulated vehicles (the differences in correlations were attributed to the greater variation in length for trucks and buses).

Responsibility--operators of trucks and buses have a particularly great responsibility, not only because of the numbers of people and

goods they can carry, but because of the greater ability of heavy vehicles to inflict damage and injury upon the motoring public.

Types of Ability--the length, mass, power train, and visibility restrictions of trucks and buses, along with the regulations under which they operate, demand different sets of abilities than those required in operation of other vehicles. The specific skills and knowledge will be described later on when license tests are discussed.

These issues, and the need for separate licensing for truck and bus operators, have been fully discussed by Waller et al (1976), Waller and Li (1979) and McKnight, Kelsey, and Edwards (1984).

As pointed out earlier, some 30 states require special licenses for operation of trucks and buses. The trend is definitely in the direction of more classified licensing; in 1976, 7 fewer states had classified licensing systems calling for separate licenses for trucks and buses.

Vehicle Size

How long, wide, or heavy must a vehicle be before it falls into the "truck-bus" category? States differ widely in the criteria they use. Weight is the most common defining characteristic. The table below is compiled from data provided by the U.S. Department of Transportation (FHWA 1983).

<u>WEIGHT</u>	<u>NUMBER OF STATES</u>
less than 9,000 lbs.	4
10,000-19,000 lbs.	8
20,000-29,000 lbs.	12
30,000 and over	3
	<u>27 states</u>

These data are just from those states using weight as a criterion. Three states classify trucks as those vehicles having more than two axles without regard to weight. Four states classify buses on the basis of passenger capacity rather than weight.

The modal weight threshold is 24,000 lbs., which serves as the threshold in 7 states. It is also the threshold proposed in the AAMVA vehicle classification plan. Such a weight threshold would permit drivers with automobile licenses to operate almost all vehicles that are used in private, non commercial transportation, including vans, pickup trucks, and small trucks used in moving household goods. We would propose the use of this threshold by the state of Arizona.

Rental Vehicles

Some states allow exceptions to weight thresholds for vehicles that are rented. The rationale is unclear. Presumably, if operation of the vehicle requires special abilities or responsibilities, a separate license should be required, whether the vehicle is rented or owned. One possible explanation is that the potential hazard of operating these vehicles is minimized when drivers are operating them infrequently on a rental basis.

The weight threshold recommended by the state of Arizona is sufficiently liberal to allow operation of vehicles that are adequate for noncommercial use without hazard to the public. We therefore see no need to make any exceptions for rental vehicles.

Tractor-Trailers

Of the 30 states requiring special licenses for trucks and buses, 28 distinguish tractor-trailers from straight trucks or buses in their classified license system. One of the remaining states makes a weight factor distinction in requiring different licenses for operators of vehicles under versus over 40,000 lbs. gross vehicle weight. Most tractor-trailers would fall in the former category, and most straight trucks and buses in the latter.

The same three factors that justify separate truck and bus licenses also justify a distinction between single unit vehicles and tractor-trailers.

Ability--a higher level of skill is required to operate a tractor-trailer for two reasons:

- o The purpose of articulation is to permit greater length, which in turn leads to the need for greater skill.
- o The articulation of tractor-trailer complicates backing maneuvers and prevention of skids (i.e. jackknife).

Responsibility--the added vehicle weight, length, and ability to jackknife increases the potential danger to other motorists. The tractor-trailer's greater potential for harm is evident in the higher involvement in fatal accidents.

Types of ability--articulation imposes requirements for additional skills and knowledge, including coupling/uncoupling and vehicle inspection.

These factors form the basis for the recommendation for a separate tractor-trailer operator's license.

Operator's License

The standard operator's license would allow drivers to operate any vehicle under 24,000 pounds GVW except for those requiring a special endorsement as will be discussed in a moment. Basically, an operator's

license would authorize people to drive cars, vans, and mopeds. The only aspect of operator licensing to warrant any discussion concerns the licensing of moped operators. Arizona requires operators of mopeds to possess a valid Arizona Operators License. This Arizona practice is currently followed by some 45 states. One state uses a separate moped operators license. The remaining five states do not require moped operators to be licensed at all.

Licensing Moped Operators

The requirement that moped operators at least hold a valid operator's license can easily be justified on the basis of the vehicles operating requirements. States that do not require moped operators to hold any license treat the moped simply as a bicycle with a motor assist. If bicycle riders don't need a license, why should moped riders?

A task analysis of moped operation by McKnight, et al. (1980) showed clearly that moped riders face hazards and operating requirements not generally encountered by bicycle riders. While the maximum speed of mopeds approximates that of bicycles, the fact that such speeds can be maintained almost indefinitely by almost any moped operator encourages trips of much greater length than those customarily taken on bicycles. Long trips generally leads to travel on major arteries and encounters with much faster moving traffic. In addition to the hazard involved with mixing with other vehicles, these same studies showed that moped drivers tend to operate their vehicles like bicycle riders, frequently violating laws that govern motor vehicle operation.

Because they are motor vehicles, and operate in the traffic stream with other motor vehicles, mopeds can only be safely ridden by operators who are familiar with safe motor vehicle operating laws and practices. Assurance that operators are at least aware of laws and practices comes only through a requirement for a valid motor vehicle operators license.

Separate Moped Licenses

The idea of a separate moped operators licenses has been advanced by the U. S. Department of Transportation (NHTSA, 1980) and the National Safety Council (NSC, 1982). The recommendation for a separate license is based upon the belief that the operation of a moped involves abilities that are unique.

However, research has shown that anyone who can ride a bicycle can also operate a moped (McKnight, et al. 1980). What is different is the moped rider's need to know how to cope with traffic. This knowledge can be assured by requiring a moped operator's license.

It has been estimated that a sizeable portion of the moped operator population consists of youth who lack access to automobiles and may not have or want an automobile operator license. Requiring them to obtain an operator's license in order to ride a moped has been considered a burden. Only one state issues a separate moped license to such individuals. However,

until mopeds become a great deal more popular than they are now, creation of a special moped endorsement for those who don't wish to obtain an A, B, OR C class license would complicate the license structure unnecessarily.

ENDORSEMENTS

The proposed classified licensing system calls for separate endorsements to operate motorcycles, school buses, emergency vehicles, or vehicles for hire (chauffeurs). The endorsement would simply be added to whatever class of license the operator holds to allow the operator to operate the endorsed vehicle as well as vehicles included in the license class. The one exception would be a motorcycle endorsement, which could also be issued, without a class designation, to someone who wishes to operate only a motorcycle.

Motorcycles

Arizona currently requires a special license for operators of motorcycles, as do some 45 of the 50 states and the District of Columbia. (MSF 1984). The motorcycle's inherent instability, inconspicuous profile, lack of operator protection, and special operating skills make operation of motorcycle unlike operation of any other type of vehicle.

There being no real need to defend the imposition of a special licensing requirement for motorcycles, this discussion will focus upon the following:

- o Use of an endorsement
- o Weight subdivisions
- o Three-wheel vehicles

Use of an Endorsement

Of the 45 states requiring special licenses for operation of a motorcycle, approximately half treat motorcycles as a special class, and half as an endorsement to another license class. However, all of the states treat their licenses the same way: By itself, the motorcycle designation--whether class or endorsement--means the operator is restricted to operating a motorcycle. Used in combination with another class, the designation means that the license holder can operate the motorcycle as well as another vehicle.

In short, the motorcycle license is both a class and an endorsement regardless of the terminology used by the state. However, since the overwhelming majority of motorcycle operators are licensed to operate other vehicles as well, the motorcycle license functions as an endorsement far more often than as a license class. For this reason, we recommend that it be treated as an endorsement, to be added to one of the other three license classes. For those few license holders to wish to operate only a motorcy-

cle, the license would carry no class designation, only a motorcycle endorsement.

Licensing officials in some states have considered eliminating the motorcycle-only designation, either as a class or endorsement and requiring motorcycle operators to obtain operators licenses first. The rationale is the motorcycle's inherently greater hazard--a death rate that is over eight times that of an automobile. To reduce the hazard, some would require that all prospective motorcycle operators first gain experience in dealing with traffic situations within the more protective confines of an automobile. Only after holding an automobile driver's license for some specified period of time would they be permitted to apply for motorcycle operator's license. If such a prerequisite were posed, motorcycle licenses could always be endorsements to automobile or some other class of license.

While the idea of requiring prior operation of an automobile should reduce the hazard in motorcycle operation, it would also impose a considerable inconvenience upon those who have never been licensed to operate an automobile and do not choose to do so. For this reason, no state has, to our knowledge, instituted such a requirement.

Weight Subdivisions

In many other countries, motorcycle licenses are subdivided according to the weight of the vehicle. (Actually, cylinder displacement is generally employed as a criterion; however, displacement is highly correlated with vehicle weight). The relationship between vehicle weight and the ability required to operate safely is believed to be the same for motorcycles as for vehicles with four or more wheels.

None of the states or provinces of North America distinguish weight classes within motorcycle licenses. nor is there any evidence of a need for weight subcategories. While it may take more ability to operate a heavier vehicle, the differences are small and found primarily in carrying out close quarters maneuvering rather than normal highway operation. In contrast with results on truck and bus tests mentioned earlier, performance on a motorcycle skill test was not found to be correlated with vehicle size (McPherson and McKnight, 1976).

Concern about differential skill demands for motorcycles of varying size has lead to studies of the relationship between vehicle size and rate of accident, injury, or fatality. Difficulties in controlling for possible amount of mileage compiled by different size motorcycles has made it impossible to determine the relationship between size and degree of hazard.

In the United States, the rate at which motorcycle riders move up in weight categories is such that requiring different licenses would impose a considerable burden on licensing operations and create considerable inconvenience for motorcycle operators.

School Buses

Arizona does not currently require operators of school buses to obtain a special license. Anyone who holds a Chauffeurs License is permitted to operate a school bus. The only requirements imposed uniquely upon operators of school buses would be those that are established by the school districts and schools employing the drivers.

At the present time, 13 states require special license for operating school buses. Eleven of the 13 states handle licensing through an endorsement, while in 2 states school bus operator licenses constitute a class.

In states not requiring a special school bus operator's license, authority to operate school buses is given through certificates issued by agencies other than the motor vehicle department. In the great majority of these states it is the State Department of Education, although a few states have the certificate issued by the Department of Public Safety or the County Department of Education.

Need for Special License

Safe operation of a school bus involves procedures which are unique to that vehicle. These procedures, described in more detail later on, include loading and unloading of students, passenger supervision, transporting handicapped students, special activities trips, evacuation procedures, operator maintenance, and reporting procedures. (McKnight and McClellan, 1971). On the other hand, the level of skill or responsibility does not appear to be any greater than that involved in operating ordinary passenger buses of the same size.

The real issue is not whether school bus operators must be required to demonstrate their knowledge of school bus operation--all states require that--but whether the issuance of a permit to operate should be made a part of the license process, or handled through certificates issued by other agencies. Requiring a special license would allow MVD to:

- o Exercise its responsibility to protect all users of public highways, including school children
- o Assess qualifications of school bus operators free from the pressures of having to provide drivers to fulfill pupil transportation needs
- o Provide skilled and experienced examiners to carry out the testing
- o Identify school bus operators with a drivers license record in order to take action against those with poor driving records

The requirement for a school bus operator's license could and should be imposed on top of whatever requirements are used by school districts, such as completion of a training program. Any state-level training requirements

can be handled by requiring all applicants for school bus operator license to produce a certificate, just as many states require a Driver Education Certificate for licensing for applicants under age 18.

Issuance of License

We recommend that Arizona issue separate school bus operator's licenses as an endorsement to one of two license classes as follows:

Large Vehicle--those seeking to operate full size school buses would be required to have a school bus endorsement to a class 2 Truck-Bus license.

Small Vehicle--those seeking to operate small van-type school buses would be required to have a school bus endorsement on a basic Class 3 Operator's license.

This way of handling endorsements would require applicants for a school bus operator's license to demonstrate, or have previously demonstrated, their ability to handle a vehicle of the size they wish to operate. Those employed by school districts having the large, standard school bus would be required to obtain a Truck-Bus operator's license which, would also permit them to operate smaller vehicles. However, those who will only be driving small vehicles for daycare centers, camps, special schools, and so on would only have to have demonstrated their ability to operate an automobile.

Emergency Vehicles

An "Emergency Vehicle", as discussed in this report, is a vehicle that is permitted exceptions to certain traffic laws when responding to emergencies. The category would include ambulances, rescue trucks, fire trucks, and police vehicles. The laws for which they are granted exception would involve speed limits, traffic signals, and lane controls.

We know of only one state (California) that requires a special endorsement for operation of emergency vehicles, such as ambulances, rescue trucks, and fire trucks. Some other states may impose certification requirements that do not show up in the licensing system.

Need for Separate License

A separate license for operators of emergency vehicles is justified by both the level and types of abilities required to operate safely:

Level of Ability--Operating in above legal speeds and weaving through traffic demands perceptual and vehicle handling skills above those required for everyday driving.

Types of Ability--Operation of emergency vehicles involves a number of unique procedures, including use of emergency signals,

negotiating intersections, radio communication, passenger care, and operation of the vehicle at emergency scenes.

Requiring special endorsement on a regular license is one way of assuring that drivers possess the experience, skills, and specific knowledges required to handle emergency vehicles with maximum safety.

Issuance of License

We recommend that an emergency vehicle operator's license be issued as an endorsement to a regular license. It is obviously too specialized to constitute a license class.

The requirement for an emergency vehicle operator's license would be waived for all law enforcement, fire fighting, and rescue service personnel operating under government agencies. Such agencies could have their own procedures for assuring the qualifications of those that drive their vehicles. There is no evidence of any deficiency in this regard. And, as a practical matter, it is very unlikely that any effort to transfer any portion of that control to an outside agency such as MVD would be very successful.

The licensing requirement would be applied primarily to drivers of private ambulances. While there is no evidence that these vehicles pose an unusual hazard, protection of those who use private ambulances, as well as those who share the road with them, demands that the drivers demonstrate their ability to operate safely.

We would recommend that the licensing requirement also be extended to those who drive fire fighting and rescue vehicles for non-governmental "volunteer" organizations. While many of the organizations that operate these vehicles take steps to assure the qualifications of their drivers, protection of the public requires that qualifications also be assured by some official agency. The MVD is in the best position to do that.

All drivers would, of course, be required to hold the class of license that is appropriate to the vehicle they are driving, whether they are employed by public or private organizations. Drivers of patrol cars, ambulances, and vans would be required to hold a Class 3 license; drivers of single unit fire apparatus (e.g. pumpers) would need a Class 2 license; drivers of articulated vehicles (e.g. ladder truck) would be required to hold a Class 1 license.

Chauffeurs License

Arizona requires drivers who operate vehicles as part of their employment to hold a Chauffeurs License. Twenty other states also employ this practice. In the remaining states, those who operate vehicles as part of their employment are incorporated into the classified licensing system through license classes and endorsements. Since few people operate trucks, buses, tractor-trailers, school buses, or ambulances except as part of their employment, issuance of a chauffeurs license to such drivers would seem

superfluous. We would recommend the chauffeur's license be retained as an endorsement required of all class 3 license holders operating vehicles as part of their employment, including drivers of taxis, limousines, shuttle buses, and so on.

With the chauffeur's license limited to operation of CDass 3 vehicles, a separate license is not demanded by either the level or type of ability required. The sole justification is the level of responsibility involved in transporting passengers and goods. In recognition of the added responsibility a separate license allows different requirements to be imposed upon holders of chauffeur's license, such as the current requirement that holders of this license be at least 18 years of age and have at least one year of driving experience.

CONDITIONAL LICENSES

A conditional license is one that allows operation of any type of vehicle but under certain conditions. Two types of conditional licenses are currently in use:

- o Learner's permit
- o Provisional license

Learner's Permit

A learner's permit, as the name implies, is a permit issued to unlicensed drivers in order to let them learn how to operate a motor vehicle. Like all other states, Arizona issues a learner's permit to drivers who do not possess the skill to operate a motor vehicle and need the practice in order to acquire that skill. The learner's permit authorizes operation of a motor vehicle subject to the condition that the driver be accompanied by a licensed operator.

Recommended changes and additions to the learners permit involve:

- o Age of licensed accompanying driver
- o Motorcycle operator's permit
- o Other vehicle classes

Age of Accompanying Driver

Arizona does not impose any minimum age on the accompanying driver. Therefore, a learner could conceivably operate a vehicle under the supervision of a 16 year old who was just licensed. It is hard to see how the presence of someone with indiscernably greater experience and maturity than

the learner going to exercise supervision. Indeed, learners might be safer by themselves than in the company of immature passengers.

A minimum age of at least 18, and preferably 21, is recommended for a driver accompanying a learner. Also, if Arizona should enact a provisional licensing law that restricts nighttime operation for young drivers (see below), whatever age limitations are imposed upon accompanying drivers during evening operation should also be applied to drivers operating under a learner's permit.

Motorcycle Operator's Permit

The requirement for accompanying passenger excludes motorcycles, for obvious reasons. Therefore, no conditions are placed upon the learner's permit for motorcycle operators. Some states have imposed a requirement that learners be accompanied by a licensed operator on another motorcycle. This attempt to extend the idea of supervision from automobiles to motorcycles is without any apparent merit.

Recognizing the potential hazard to motorcycle operators during the learning phase, some states have excluded learners from operating at night or on an interstate. Both of these restrictions would reduce exposure to skill-demanding situations without subjecting the learners to undue inconvenience (motorcycles are used relatively infrequently at nights and on interstates). It is proposed that these restrictions be imposed upon motorcycle operator learners permits.

Other Vehicles

Since Arizona does not currently require separate licenses for operation of the other vehicles making up the classified licensing system--trucks, buses, tractor-trailers, school buses, emergency vehicles--it has not been necessary to consider issuance of a learner's permit. However, if drivers of these vehicles are required to demonstrate their ability to safely operate the vehicle before being issued a license, they must be provided a means of gaining the practice needed to provide that demonstration.

As well as can be determined from available literature, no state currently requires learner's permits for operation of vehicles other than automobiles and motorcycles. So long as drivers hold a valid operator's license, they have demonstrated their knowledge of safe driving rules and practices as well as their ability to handle an automobile. Requiring them to apply for a separate learner's permit would accomplish nothing except to inconvenience the drivers and add to the volume of license stations.

It is recommended, however, that drivers operating trucks, buses, tractor-trailers, school buses, or emergency vehicles on regular operator licenses be accompanied by a driver licensed to operate that particular vehicle. The requirement is necessary not only for the safety of the public, but also to provide some reason for drivers to seek licenses of the appropriate class or endorsement. Thus, with such a requirement, people

could drive on their operator's license indefinitely, claiming to be learners.

Provisional Licenses

A provisional license is a license issued to novice drivers, containing certain "provisions" that must be met before a regular license can be issued. The purpose of the provisions is to reduce the hazards novice drivers face because of their lack of experience. Provisional licensing attempts to reduce such hazards by (1) prohibiting operation under potentially hazardous conditions, (2) providing incentives for drivers to operate safely, and (3) extending the period of learning. A comprehensive discussion of the nature and purpose of provisional licensing is provided by Croke and Wilson (1977) in connection with their development of a model provisional program for the U.S. Department of Transportation.

Currently eight states issue provisional licenses to inexperienced drivers under the age of 18. This total does not include states that issue licenses to certain categories of people under age 18 to engage in specialized travel (e.g. farm workers). We recommend that Arizona seek passage of legislation that would create a provisional license.

Advantages of Provisional Licensing

The rationale underlying provisional licensing is that lack of experience makes the first few months of automobile operation the most dangerous, and that new drivers should be protected as much as possible from encountering the hazards of the highway traffic environment while they are learning. Provisional Licensing attempts to accomplish this in three ways:

Reduced Exposure--Restrictions placed upon provisional licenses attempt to reduce the new driver's exposure to traffic hazards. The most common restriction is a curfew that keeps novice drivers off the road in the late night and early morning hours when visibility is poorest, the incidence of drinking/driving is greatest, and novice drivers are most overrepresented in accidents. The state of New York also prohibits travel in New York City. Other exposure reducing restrictions that have been considered include prohibiting passengers and requiring the use of safety belts or helmets.

Safety Incentive--The provisional license often requires a period of violation free driving before drivers can qualify for a regular operator's license and thus escape the restrictions of a provisional license. Coupling removal of restrictions with violation free driving creates an incentive to lawful driving. Many programs also lower the threshold for driver improvement action for drivers on provisional licenses, creating another incentive to lawful driving.

Extended Learning--The role of licensing in fostering participation in driver education has been well established by the increase

in enrollment which has occurred when completion of Driver Education has been made a licensing requirement.

Unfortunately, once a license has been obtained, the learning incentive largely disappears. It has been estimated that less than 2 percent of licensed drivers will voluntarily enroll in a driver education activity (McKnight, McPherson, and Knipper 1980). A provisional license provides an incentive for learning beyond the initial licensing.

Attempts to evaluate provisional license programs has produced equivocal results. Preusser et al (1983) reported reductions in nighttime accidents of 25 percent to 69 percent in four states where curfew laws were a part of the provisional license program. However, in three of the states, the study involved comparing accident rates by age and hour for the curfew states with those of a control state. There is no way of knowing whether the differences found were due to the curfew or just reflective of chance differences across states. In the one state in which a pre-post comparison was made, a separate evaluation by McKnight, Hyle, and Albrecht (1983) found the results to be attributable to long-term trends which began long before and continued long after the program was implemented. However, the curfew covered a period when very few teenagers were driving anyway (1:00 a.m.-6:00 a.m.) and didn't provide a fair test of curfews in general. In the other three states, curfews began at 11:00 p.m.

While the study by McKnight, Hyle, and Albrecht failed to show the effect of a curfew upon nighttime accidents, there was a 5 percent decrease in accidents and a 10 percent decrease in violations among 16-17 year olds during non-curfew hours. Since only half of the drivers in the two age groups were on provisional licenses, the effect of the provisional licensing program upon those holding provisional licenses could be as high as 10 percent and 20 percent for accidents and violations respectively. These reductions were attributed to the incentive affect of a curfew coupled with a requirement for violation free driving. While the program also had a provision for extended learning (parents to provide instruction), this aspect of the program was not fully implemented and was therefore not believed to have contributed to the success of the program.

Recommended Provisional Licensing Program

While evidence as to the effectiveness of provisional licensed is not totally conclusive, it is sufficiently convincing to warrant implementation of a program in the state of Arizona. We recommend the Arizona MVD seek legislation that would permit issuance of a provisional license having the following provisions:

Applicable Drivers--A provisional license would be required of all previously unlicensed drivers under the age of 18.

Conditions Imposed--Drivers operating on a provisional license would be prohibited from operating a motor vehicle between the hours of 11:00 p.m. and 5:00 a.m. unless accompanied by a licensed adult.